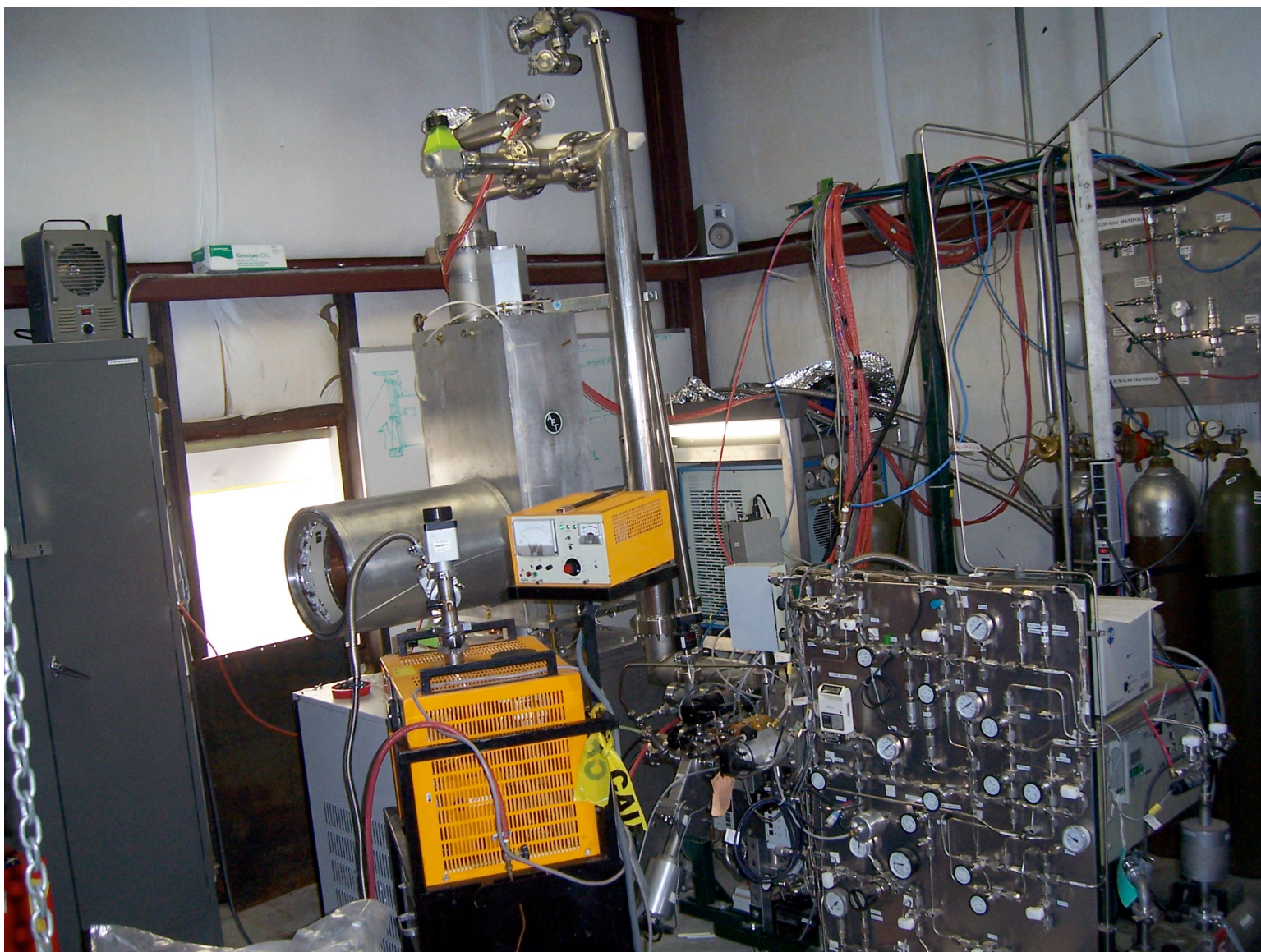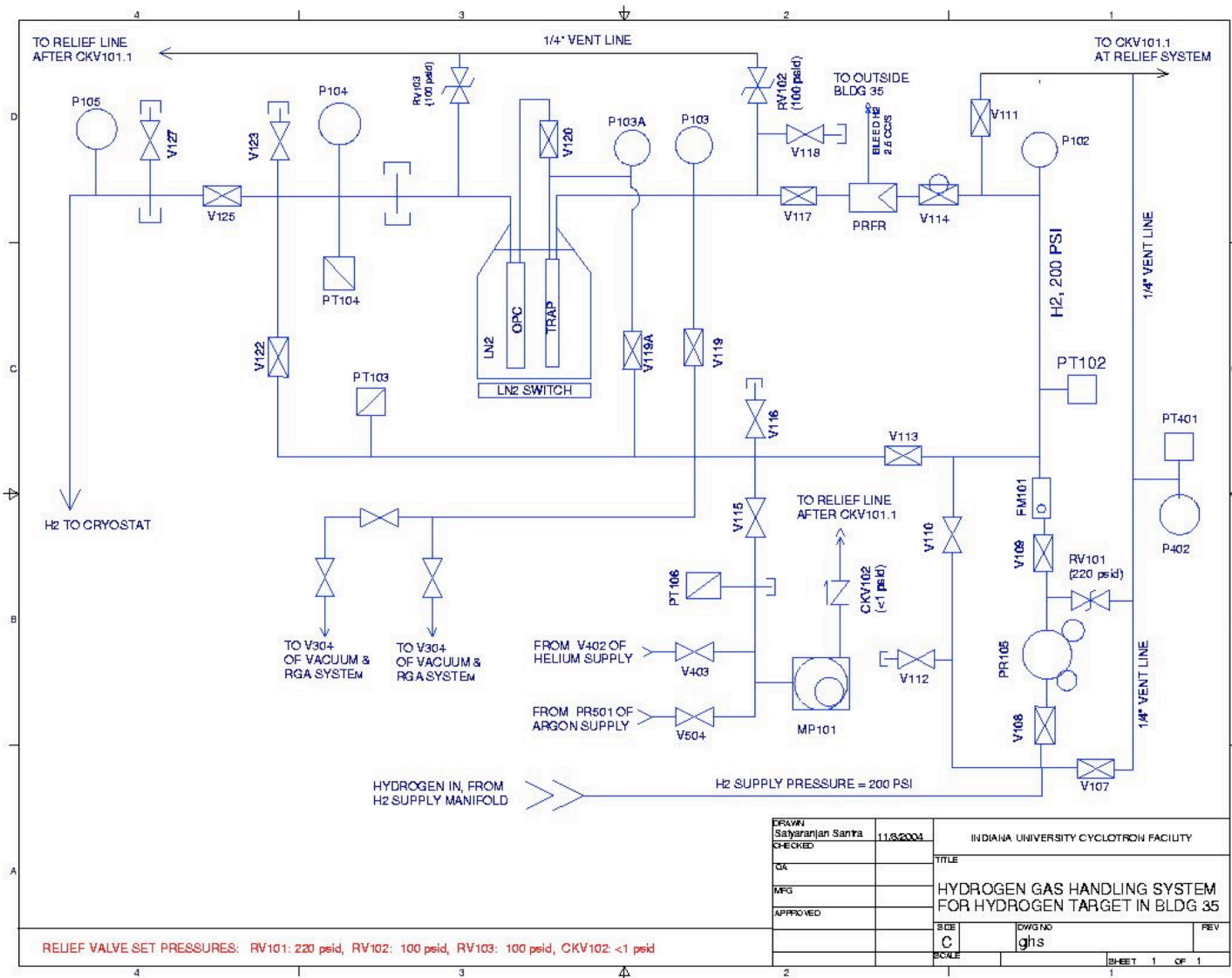# Ventilation of the LH2 Target GHS

<u>In MPF-35:</u>

The target gas handling system (GHS), target cryostat, and part of the vent stack are covered by a tent that is ventilated by a 10" diameter duct outside of the building.
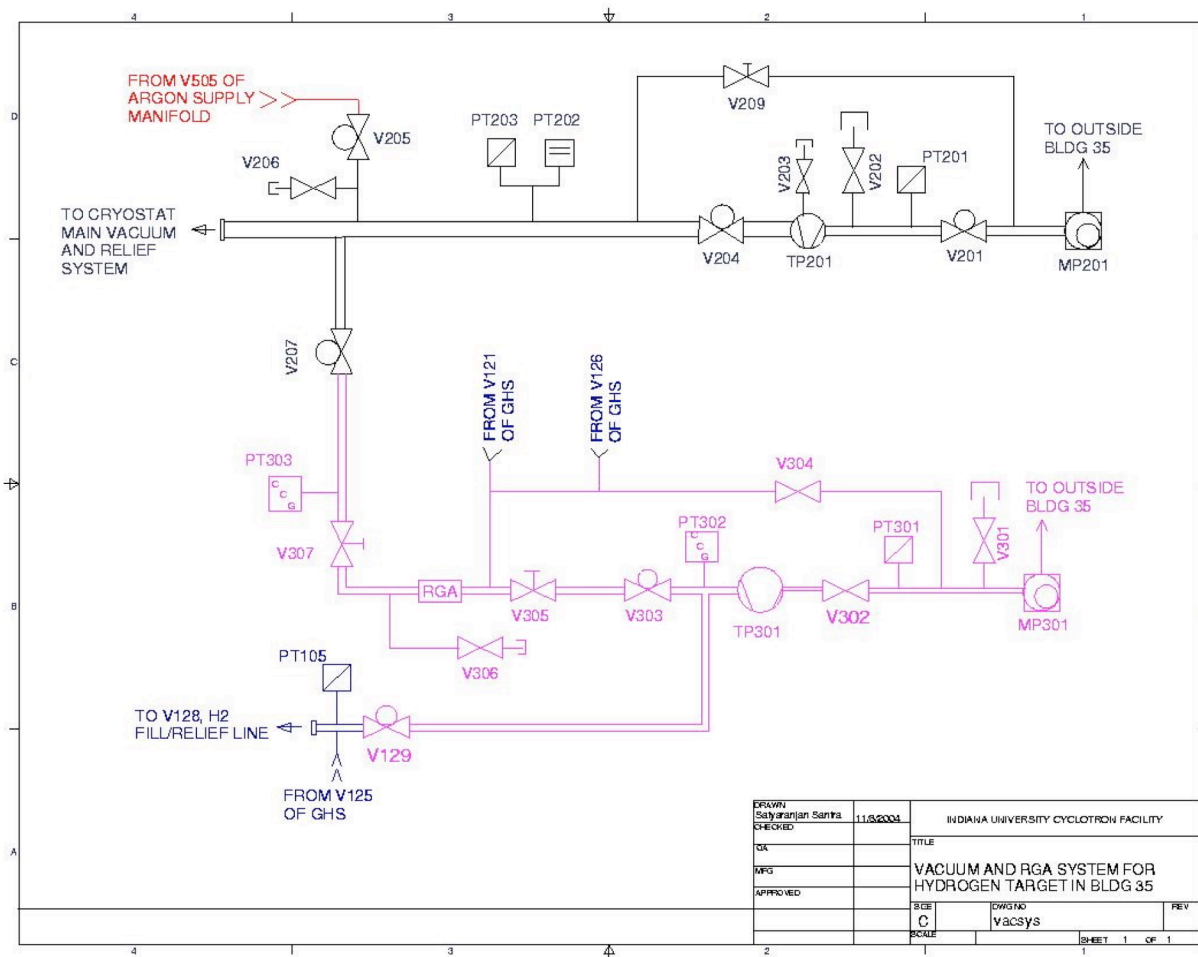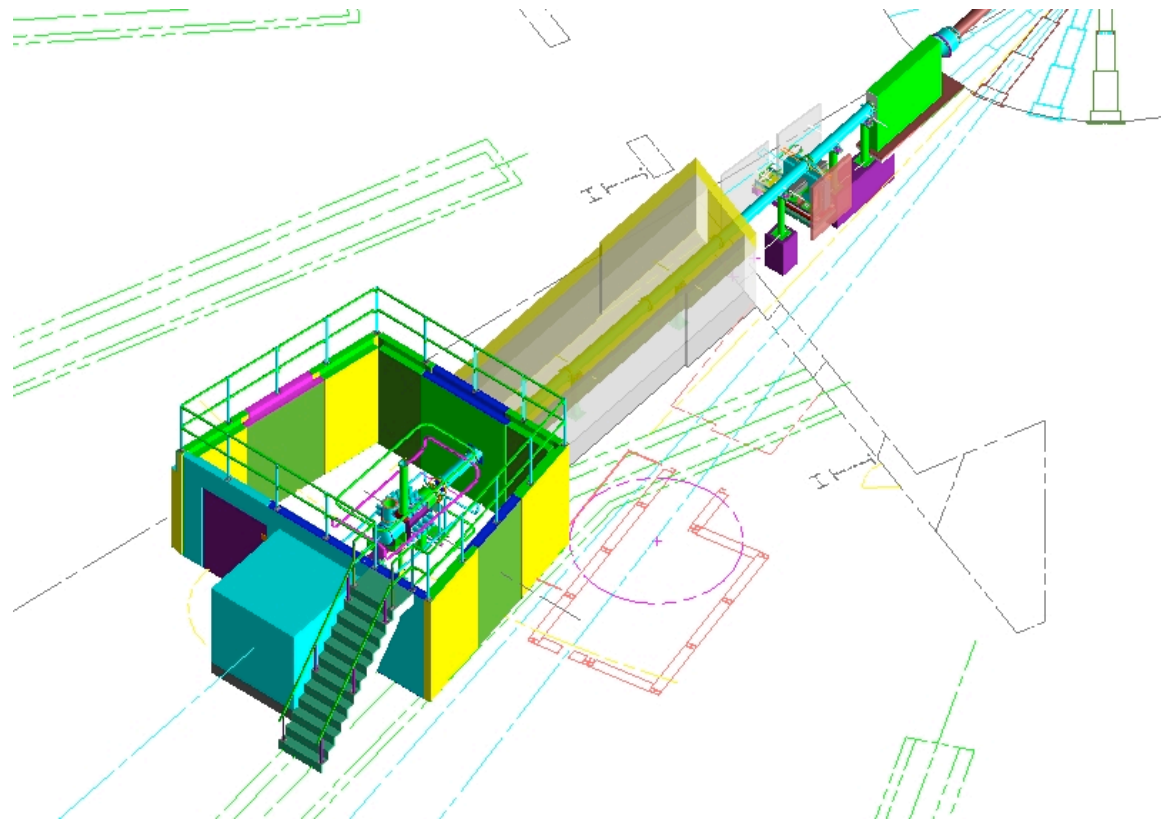
<u>At ER2:</u>

• GHS is boxed to an enclosure that is ventilated outside of ER2.

• Sizing of the ventilation is effected by

– because of the membrane purifier H2 flow is limited to 10 SLM.

– supply pressure to the purifier is 200 psi.

– after the purifier pressure is limited to 15 psid by relief valves.

TO RELIEF LINE
AFTER CKV101.1

1/4" VENT LINE

TO OUTSIDE
BLDG 35

TO CKV101.1
AT RELIEF SYSTEM

P105

V127

V123

P104

RV103
(100 psid)

V120

P103A

P103

RV102
(100 psid)

V118

BLEED H2
2.5 CCS

V111

P102

V125

V117

PRFR

V114

H2, 200 PSI

1/4" VENT LINE

PT104

V122

OPC

TRAP

LN2

LN2 SWITCH

V119A

V119

PT102

PT401

PT103

V116

V113

P402

H2 TO CRYOSTAT

V115

TO RELIEF LINE
AFTER CKV101.1

V110

FM101

V109

RV101
(220 psid)

PT106

CKV102
(<1 psid)

TO V304
OF VACUUM &
RGA SYSTEM

TO V304
OF VACUUM &
RGA SYSTEM

FROM V402 OF
HELIUM SUPPLY

V403

PR105

1/4" VENT LINE

FROM PR501 OF
ARGON SUPPLY

V504

MP101

V112

V108

HYDROGEN IN, FROM
H2 SUPPLY MANIFOLD

H2 SUPPLY PRESSURE = 200 PSI

V107

DRAWN Satyaranjan Santra 11/3/2004
CHECKED
QA
MFG
APPROVED

INDIANA UNIVERSITY CYCLOTRON FACILITY

TITLE
HYDROGEN GAS HANDLING SYSTEM
FOR HYDROGEN TARGET IN BLDG 35

SIZE C

DWG NO ghs

REV

SCALE

SHEET 1 OF 1

RELIEF VALVE SET PRESSURES: RV101: 220 psid, RV102: 100 psid, RV103: 100 psid, CKV102: <1 psid

FROM V505 OF
ARGON SUPPLY
MANIFOLD

V205

V206

PT203   PT202

V209

V203   V202   PT201

TO OUTSIDE
BLDG 35

TO CRYOSTAT
MAIN VACUUM
AND RELIEF
SYSTEM

V204   TP201   V201   MP201

V207

FROM V121
OF GHS

FROM V126
OF GHS

V304

PT303
C
C
G

PT302
C
G

PT301

TO OUTSIDE
BLDG 35

V307

V301

RGA   V305   V303   TP301   V302   MP301

V306

PT105

TO V128, H2
FILL/RELIEF LINE

V129

FROM V125
OF GHS

DRAWN Satyaranjan Santra	11/8/2004	INDIANA UNIVERSITY CYCLOTRON FACILITY
CHECKED		
QA		TITLE
MFG		VACUUM AND RGA SYSTEM FOR HYDROGEN TARGET IN BLDG 35
APPROVED		

SIZE C

DWG NO vacsys

REV

SCALE

SHEET 1 OF 1

H2 flow is limited to
10 SLM at 200psi

- - maximum H2 leak can be 10 SLM because of the flow restriction.
- - to stay below 2% H2 concentration level, we need 10/0.02=500 SLM (=18CFM) air flow through the enclosure.

From fluid physics we have $\dfrac{dp}{\rho} = -g dz$

Stack effect $\Delta p = (\rho_{air} - \rho_{H2})z$

- $z = 45$ ft height of the stack
- $\Delta \rho = 0.001$ lb/cft difference in densities

This gives to driving pressure $\Delta p = 0.045$ lb/sq ft

from Ashrae nomograph for 8" pipe and 100 ft long we get air flow rate of 60 CFM.

→ H2 concentration in the enclosure will be always bellow 2% even in the worst-case incident.

What is the requirement for the ventilation line -----> stainless steel pipe or just a duct?